

CLAIMS

What is claimed is:

- 1 1. A method comprising:
2 classifying an incoming packet into one of a plurality of flows;
3 determining an estimate of a load of the plurality of flows on a scarce
4 resource; and
5 implementing a drop policy for at least one flow when the estimate
6 exceeds a predicted threshold.
- 1 2. The method of Claim 1 wherein determining comprises:
2 aggregating a cost estimate of all packets within a flow to generate a flow load
3 estimate for each flow; and
4 summing the individual flow load estimates to yield a total load
5 estimate.
- 1 3. The method of Claim 1 further comprising:
2 allocating a portion of the scarce resource to each flow of an expected
3 plurality of flows.
- 1 4. The method of Claim 3 further comprising:
2 identifying which flows of the plurality of flows exceeds their
3 allocation.
- 1 5. The method of Claim 4 further comprising:
2 distributing excess capacity from flows that do not exceed their
3 allocation to those flows that exceed their allocation.
- 1 6. The method of Claim 1 wherein implementing comprises:
2 computing a reduction factor based on aggregate over utilization of the
3 processor.

1 7. The method of Claim 1 wherein implementing a drop policy
2 comprises:

3 accessing a location in a drop buffer;
4 dropping a current packet if the location has a first value;
5 serving the current packet if the location has a second value; and
6 advancing a buffer pointer to point to a next buffer location.

1 8. The method of Claim 1 wherein the drop policy is established on a flow
2 by flow basis.

1 9. The method of Claim 1 wherein determining comprises:
2 generating a cost factor for an incoming packet based on at least one of
3 packet type and packet length.

1 10. The method of Claim 6 wherein computer comprises:
2 determining a total under utilization by flow not exceeding an expected
3 load on the scarce resource;
4 adding the total under utilization to an expected load of excessive
5 flows; and
6 dividing the sum by an offered load of excessive flows.

1 11. The method of Claim 1 further comprising:
2 decreasing the predicted threshold if the scarce resource is over utilized
3 when the load is equal to the predicted threshold; and
4 increasing the predicted threshold if the scarce resource is under
5 utilized at the predicted threshold.

1 12. The method of Claim 11 wherein each decrease has a greater absolute
2 value than each increase.

1 13. A computer readable storage media containing executable computer
2 program instructions which when executed cause a digital processing system to
3 perform a method comprising:

classifying an incoming packet into one of a plurality of flows;
determining an estimate of a load of the plurality of flows on a scarce
resource; and
implementing a drop policy for at least one flow when the estimate
exceeds a predicted threshold.

14. The computer readable storage media of Claim 13 which when
executed cause a digital processing system to perform a method further comprising:
aggregating a cost estimate of all packets within a flow to generate a
flow load estimate for each flow; and
summing the individual flow load estimates to yield a total load
estimate.

15. The computer readable storage media of Claim 13 which when
executed cause a digital processing system to perform a method further comprising:
allocating a portion of the scarce resource to each flow of an expected
plurality of flows.

16. The computer readable storage media of Claim 15 which when
executed cause a digital processing system to perform a method further comprising:
identifying which flows of the plurality of flows exceeds their
allocation.

17. The computer readable storage media of Claim 16 which when
executed cause a digital processing system to perform a method further comprising:
distributing excess capacity from flows that do not exceed their
allocation to those flows that exceed their allocation.

18. The computer readable storage media of Claim 13 which when
executed cause a digital processing system to perform a method further comprising:
computing a reduction factor based on aggregate over utilization of the
processor.

1 19. The computer readable storage media of Claim 13 which when
2 executed cause a digital processing system to perform a method further comprising:
3 accessing a location in a drop buffer;
4 dropping a current packet if the location has a first value;
5 serving the current packet if the location has a second value; and
6 advancing a buffer pointer to point to a next buffer location.

1 20. The computer readable storage media of Claim 13 which when
2 executed cause a digital processing system to perform a method further comprising:
3 the drop policy is established on a flow by flow basis.

1 21. The computer readable storage media of Claim 13 which when
2 executed cause a digital processing system to perform a method further comprising:
3 generating a cost factor for an incoming packet based on at least one of
4 packet type and packet length.

1 22. The computer readable storage media of Claim 18 which when
2 executed cause a digital processing system to perform a method further comprising:
3 determining a total under utilization by flow not exceeding an expected
4 load on the scarce resource;
5 adding the total under utilization to an expected load of excessive
6 flows; and
7 dividing the sum by an offered load of excessive flows.

1 23. The computer readable storage media of Claim 13 which when
2 executed cause a digital processing system to perform a method further comprising:
3 decreasing the predicted threshold if the scarce resource is over utilized
4 when the load is equal to the predicted threshold; and
5 increasing the predicted threshold if the scarce resource is under
6 utilized at the predicted threshold.

1 24. The computer readable storage media of Claim 23 wherein each
2 decrease has a greater absolute value than each adjustment upward.

1 25. An apparatus comprising:
2 a network input interface; and
3 a processor coupled to the input interface and having a capacity, the
4 processor to implement a drop policy at the input interface when aggregate
5 utilization of the processor by a plurality of flows exceeds a threshold.

1 26. The apparatus of Claim 25 further comprising:
2 a memory coupled to the processor to store a drop buffer, the drop
3 buffer populated to simulate randomization of drop events based on a drop factor.

1 27. The apparatus of Claim 26 wherein the memory stores a cyclic buffer
2 corresponding to each supported reduction factor.

1 28. The apparatus of Claim 25 wherein the processor implements a packet
2 to flow classification algorithm to group incoming packets into flows.

1 29. The apparatus of Claim 25 wherein the threshold is approximately
2 equal to the capacity.